

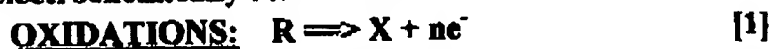
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AMENDMENTS TO THE SPECIFICATION:

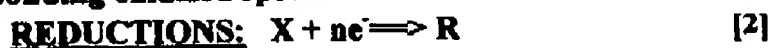
Page 2, lines 3-16:

ABLE TABLE 1 . Amperometric Gas Sensors can address a variety of analytes.

Many electrochemically reactive molecules can be detected.

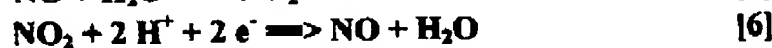
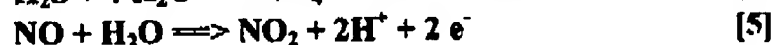
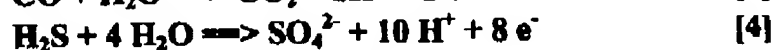
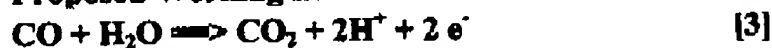


where R may be N_2H_4 , SO_2 , C_2H_5OH , C_2H_2 , NH_3 , H_2 , NO , or HC and X is the corresponding oxidized species



where X may be O_2 , O_3 , Cl_2 , Br_2 , I_2 , or NO_2 ,...

Proposed Working Electrode Half-Cell Reactions Include:



Page 9, line 11, through page10, line 8:

In the case of the most common ambient temperature AGS, the CO sensor, the electrolyte 7 is 4 M H_2SO_4 , and the same Pt-black catalyst used in 1969 for ethanol and CO is still used today for all three electrodes 1, 3, and 5. The three electrodes are sealed or otherwise bonded to a cell body 2 so that they are in electrolytic contact with each other. Typical AGSs, especially those for CO, have the CE and RE fairly close to each other and to the WE, as shown in the cross-sectional diagram of Figure 2A. The construction of the modern AGS of this type hinges around the development of the Teflon-bonded fuel cell electrode. The WE electrocatalyst is a composite Teflon-catalyst mixture bonded to one side of a gas-permeable electrolyte-impervious hydrophobic Teflon membrane. The WE composite membrane serves several purposes by being hydrophobic to keep the electrolyte from leaking out while at the same time providing a porous gas path to the ~~high-surface-area~~ high-surface-area electro-catalyst for efficient reaction of the analyte. The amount of Teflon in the electro-catalyst layer is carefully adjusted for maximum performance of the sensor. The composition must contain sufficient Teflon to bind the catalyst particles together and to the membrane, providing structural rigidity. Yet it is important to minimize the amount of the insulating Teflon binder so as to maintain a high electrical conductivity. An optimum value of Teflon

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retains porosity and maximizes the triple phase boundary [solid catalyst, liquid electrolyte, and gas analyte] where the reaction occurs fastest. From the electrochemical point of view, the process of signal generation in such a sensor can be seen to be a function of the geometry or structure of the sensor as well as of the materials chosen for the electro-catalytic reaction. Hence this invention is partly focused on new materials for electrodes and on novel structures or geometries. The generic mechanism presented above is at least conceptually applicable to most if not all AGS types and is well known. Some variations of this structure are also possible. The placement of the electrode onto a solid polymer electrolyte [e.g., Nafion] eliminates the need for the Teflon membrane. Such structures have been microfabricated and produced sensors with very fast response signals for NO and H₂S.

Page 11, lines 18-20:

B. Making the ~~CE/RE~~ CE/RE from a different material, e.g., for CO sensors having the CE/RE catalyst comprise Ir or oxides of Ir, Au, Pb/PbO₂, Ag/AgCl, Ru, Pd, low-surface-area (e.g., vapor-deposited) Pt or any other substance at which electro-oxidation of CO is hindered; or

Page 12, lines 8-13:

The cross-sectional view of Figure 2B illustrates the separation of the CE and RE from the sampled air inlet by a barrier 8, which may be made of fritted glass or of Nafion, and the introduction of a second hole 6 through which filtered, analyte- and interference-free air may be introduced into the CE/RE compartment for the oxidizing oxygen reduction reaction 7 to proceed unabated. The feeding of filtered air to the CE/RE through a separate hole is applicable not only to the CO sensor of Figure 2 but to any other AGS wherein the analyte is oxidizable.

Page 14, lines 1-11:

With the WE and the CE serving as two sensing electrodes that are close to one another as the analyte passes through the sensor in their vicinity, then electrodes 11 and 13 perform the oxidation reaction 1 and the reduction reaction 2 of Table 1, respectively. Thus, an analyte molecule R is changed to its oxidized form X at electrode 11 and then back to the original analyte molecule R at electrode 13. If the sensor is designed so that the distance between the electrodes is small as in a ~~nano-structured or even micro-structured~~ micro-structured or even nano-structured interdigitized electrode array, then these reactions can occur repeatedly many times to the same molecule. An analyte molecule that is exposed to this new AGS electrode structure or geometry will be continuously changing back and forth and back again, producing electrons at each reaction site as it proceeds through the interdigitized electrode array. It will thus produce

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many more electrons than in the simple AGS, it will produce a cascade of electrons and therefore an amplified signal.

Page 16, lines 8-17:

A single molecule can proceed along the sample gas path producing electrons as long as it is near the electrodes. If the electrodes are close together, the same analyte molecule of NO or NO₂ that enters the detector, will, over time, elicit multiple electrons from each sensing electrode. The number will depend upon the rate of the electrochemical process and the time to diffuse between each electrode. To minimize any ~~loses~~ losses from processes such as oxidation to NO₃⁻ or diffusion into the solution and away from the reaction zone, the electrodes should be preferably microfabricated so that interdiffusional distances are small [of micron dimensions]. Sub-millimeter electrodes may be constructed using an ink-printing technique or by lithographically defined vapor deposition of electrodes having dimensions of about 100 microns so as to minimize the loss processes.